

REMARKSRejection of Claims 1-17 under 35 U.S.C. § 112

The Examiner has rejected Claims 1-17 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner states that the claims have been amended to recite that "the isocyanate of said system consists essentially of blocked isocyanate." The Examiner further states that although the specification indicates the desire to exclude free isocyanates, the specification does not give an indication of what other components would be included with the blocked isocyanate, and thus it is not clear in the specification which components would be included or excluded from the blocked isocyanate component.

In the context of the present claims, the term "isocyanate" refers to the isocyanate component of the blocked isocyanate urethane system. The present claims recite that the isocyanate of the blocked isocyanate urethane system consists essentially of blocked isocyanate. This phrase indicates that the isocyanate of the blocked isocyanate urethane system consists essentially of blocked isocyanate, for example, that the isocyanate of the blocked isocyanate urethane system contains essentially no free isocyanate. Further, Applicants have included in the specification examples having essentially block isocyanate employed.

In light of these remarks, Applicants request withdrawal of the Examiner's rejection of Claims 1-17 under 35 U.S.C. § 112.

Rejection of Claims 1-2 and 4-7 under 35 U.S.C. § 102(b)

The Examiner has rejected Claims 1-2 and 4-7 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 3,770,555 to Gladstone, *et al.*, (hereinafter referred to as "Gladstone") as evidenced by U.S. Patent 3,252,848 to Borsellino (hereinafter referred to as "Borsellino").

The claimed invention is directed to coated adhesive belts, and methods for their formation, comprising a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate.

Gladstone discloses a dried, preformed adhesive film that comprises a component having available free isocyanate groups and a poly-functional active hydrogen containing component

consisting of a hydroxyl terminated polyurethane polyester and a member containing at least difunctional active hydrogen.

Gladstone neither teaches nor suggests an adhesive formed from a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. The isocyanate component of the Gladstone adhesive film (described above) is not a blocked isocyanate but instead has free isocyanate groups. (See Gladstone at column 6, line 48 through column 7, line 3). For example, Gladstone discloses the use of Mondur CB-75, a non-blocked polyurethane prepolymer in solution.

The claims were previously amended to a joint adhesive for joining the first portion to the second portion to form the belt, wherein the adhesive is formed from a blocked isocyanate urethane system wherein the isocyanate of said system consists essentially of blocked isocyanate. Also, analysis, such as by mass spectrography, of a coated abrasive belt that is formed from a blocked isocyanate would disclose blocking agent residue that is not present in free isocyanate systems.

While Gladstone discloses that the member containing at least difunctional active hydrogen can include, among many others, polyester-polyurethane isocyanate blocked prepolymer and a polyether-polyurethane isocyanate blocked prepolymer, these components are not the free isocyanate groups required by Gladstone. As discussed above, Gladstone requires the presence of free isocyanate groups, such as provided by Mondur CB-75. Figure 1 of the present disclosure illustrates the limited pot life of a typical prior art joint system such as the free isocyanate containing system of Gladstone. The claimed invention provides for blocked isocyanate groups to prevent reaction with active hydrogen groups prior to removal of the blocking groups and produces improved pot life of the isocyanate urethane system and reduced sensitivity to environmental moisture.

Further, Borsellino does not remedy Gladstone by evidencing a blocked isocyanate urethane system wherein the isocyanate of said system consists essentially of blocked isocyanate.

Rejection of Claim 3 under 35 U.S.C. §103(a)

The Examiner has rejected Claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Gladstone.

The claimed invention is directed to coated adhesive belts comprising a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. Advantageously, the present invention utilizes blocked isocyanates to improve pot life of the isocyanate urethane system and to reduce sensitivity of the system to the humidity of ambient air. These qualities of the isocyanate urethane system produce more consistent belt joint quality. (See Specification at page 3, lines 19-24; page 2, lines 24-27; and page 6, lines 8-14).

Gladstone does not teach or suggest, as the Examiner implies, choosing components for a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate to improve pot life of the isocyanate urethane system and to reduce sensitivity of the system to the humidity ambient air. Instead, as discussed above, Gladstone discloses a dried, preformed adhesive film formed from an admixture comprising free isocyanate groups. Thus, Gladstone does not teach or suggest a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate and also includes an amine as is presently claimed.

Furthermore, Applicants disagree with the implication by the Examiner that Gladstone discloses that the shelf life can be optimized by choosing different compounds, such as a combination including a blocked isocyanate prepolymer and an amine-functional component. Gladstone does not provide any teaching or motivation for a blocked isocyanate urethane system including an amine nor does Gladstone teach or suggest the advantages gained as a result of practicing the claimed invention such as long pot life of a blocked isocyanate urethane system and more consistent belt joint quality. (See Detailed Description at page 6, lines 8-14).

Moreover, one skilled in the art would not have been motivated to prepare an isocyanate urethane system for increased pot life comprising free isocyanate groups and also amine groups due to the high reactivity of isocyanate with materials, such as amine. (See Specification at page 2, line 24 through page 3, line 3). The isocyanate groups of the claimed system are blocked to prevent reaction with active hydrogen groups prior to removal of the blocking groups and produces improved pot life of the isocyanate urethane system and reduced sensitivity to environmental moisture.

The claimed invention is both novel and non-obvious over Gladstone, *et al.*, both alone and in view of Borsellino. In light of the above arguments, Applicants request reconsideration and withdrawal of the Examiner's rejections under 35 U.S.C. §§ 102(b) and 103(a).

Rejection of Claims 8-9 and 12-16 under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 8-9 and 12-16 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,919,549 to Van, *et al.*, (hereinafter referred to as "Van") in view of U.S. Patent 4,699,824 to Pufahl (hereinafter referred to as "Pufahl"). The Examiner states that Van discloses endless abrasive belts produced by applying a splicing adhesive to strips of abrasive material, joining the strips, and heating the belt. The Examiner further states that Van does not specify the type of adhesive to be used as a splicing adhesive. The Examiner then states that Pufahl discloses a pressure-sensitive adhesive (preferably comprising a crosslinking flame retardant of a blocked isocyanate) for splicing materials that is flame resistant and capable of functioning at extreme temperatures. The Examiner also states that because the abrasive articles of Van are used for applications where friction increases temperature, it is the Examiner's position that it would have been *prima facie* obvious to use the splicing adhesive of Pufahl's invention in the abrasive belts of Van's invention.

The claimed invention is directed to methods for the formation of coated adhesive belts, comprising a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. Advantageously, the present invention utilizes blocked isocyanates to improve pot life of the isocyanate urethane system and to reduce sensitivity of the system to the humidity of ambient air. These qualities of the isocyanate urethane system produce a more consistent belt joint quality for abrasive belts. (See Specification at page 3, lines 19-24; page 2, lines 24-27; and page 6, lines 8-14). Consistent belt joint quality is demonstrated by Figures 2 and 3.

Van does not teach or suggest methods for the formation of coated adhesive belts using a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. Van does not teach or suggest the advantages, e.g., improved pot life of the isocyanate urethane system, reduced sensitivity of the system to the humidity of ambient air, and consistent belt joint quality, gained by practice of the present invention.

Along with Van, Pufahl does not teach or suggest methods for the formation of coated adhesive belts using a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. Pufahl is directed to a pressure sensitive adhesive tape of particular utility as a flying splice, as a retention means, and as a mounting tape. (See Pufahl Abstract). Pufahl does not teach, suggest, or provide motivation for the use of the pressure sensitive adhesive tape disclosed therein in the production of coated abrasive belts.

Pufahl is directed to a pressure sensitive tape having a frangible substrate formed of a ply of a cured resinous aldehyde-based condensate or a fibrous cellulosic web impregnated with said condensate and a elastomeric pressure sensitive adhesive applied to the substrate. Pufahl discloses that the crosslinking flame retardant of a blocked polyisocyanate (referred to by the Examiner) is a part of the substrate material and not the adhesive. (See e.g., Pufahl at column 15, lines 16-20: "The polyisocyanate is included in an amount sufficient to constitute 0.25 percent to 10 percent, and preferably from 5 percent to 10 percent, by weight of the substrate, and preferably cellulose substrate."). As further support, Pufahl states that the flame retardant is excluded from the elastomeric adhesive and is incorporated in the substrate. (See Pufahl at column 6, lines 22-35). Pufahl does not teach or suggest using an adhesive formed from a blocked isocyanate urethane system wherein the isocyanate of said system consists essentially of blocked isocyanate as stated in Claims 8-12. Nor does Pufahl teach or suggest joining the ends of a strip of coated abrasive with a blocked isocyanate urethane system as stated in Claims 13-17. Instead, the thermosetting or thermoplastic elastomeric pressure sensitive adhesive employed in accordance with Pufahl includes natural, chlorinated, ABS and SB rubber, chloroprene homopolymers and copolymers, acrylic resins, adhesives produced from acrylic acid and acrylic ester monomers and mixtures thereof, and copolymers thereof with other monomers. (See Pufahl at column 23, lines 56-63).

Neither Van nor Pufahl, alone or in combination, teach the presently claimed invention. Neither reference, alone or in combination, teaches or suggests methods for the formation of coated adhesive belts using a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. Van, as acknowledged by the Examiner, does not specify the type of adhesive to be used as a splicing adhesive, and Pufahl, as discussed above, does not teach an adhesive formed from a blocked isocyanate urethane system wherein the

isocyanate of the system consists essentially of blocked isocyanate. In addition, neither reference provides motivation for the combination of references and therefore Applicants submit that the combination is improper under 35 U.S.C. § 103(a). Van does not teach, suggest, or provide motivation for the use of a pressure sensitive tape as disclosed by Pufahl for producing abrasive articles. Pufahl does not teach or suggest, or provide motivation for the use of the pressure sensitive adhesive tape disclosed therein in the production of coated abrasive belts as described by Van.

The presently claimed invention is non-obvious over Van in view of Pufahl. Applicants therefore request withdrawal of the Examiner's rejection of Claims 8-9 and 12-16 under 35 U.S.C. § 103(a).

Rejection of Claims 1-2, 4-8 and 10-17 under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1-2, 4-8 and 10-17 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,519,095 to Case (hereinafter referred to as "Case") as evidenced by U.S. Patent No. 4,111,666 to Kalbow (hereinafter referred to as "Kalbow") and in view of pages 93-94 of Polyurethane Handbook by Oertel (hereinafter referred to as "Oertel"). The Examiner states that Case discloses a method of forming an abrasive belt using an adhesive using a polyesterurethane, a crosslinking agent such as isocyanate, and a reactive polyol solvent. The Examiner then states that Oertel teaches the conventionality of using blocked isocyanates to improve stability at room temperature and to prevent reaction for a desired amount of time. The Examiner states that since Case notes the disadvantages of short cure times, it is the Examiner's position that it would have been *prima facie* obvious to blocked the isocyanates of Case's invention to prevent premature reaction of materials.

The claimed invention is directed to a coated abrasive belt and methods for the formation of coated adhesive belts, comprising a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate. Advantageously, the present invention utilizes blocked isocyanates to improve pot life of the isocyanate urethane system and to reduce sensitivity of the system to the humidity of ambient air. These qualities of the isocyanate urethane system produce more consistent belt joint quality for abrasive belts. (See

Specification at page 3, lines 19-24; page 2, lines 24-27; and page 6, lines 8-14). Consistent belt joint quality is demonstrated by Figures 2 and 3.

Case is directed to adhesive formulations comprising a polyesterurethane, a crosslinking agent and a reactive polyol solvent. The polyol solvent of Case is capable of reacting with the crosslinking agent at the application temperature, e.g., below about 100°C, as stated in Case Claim 1. Case teaches an adhesive formulation wherein a reactive polyol solvent is used to increase the rate of polymer bond formation. "Because there is little or no non-reactive solvent in the [Case] formulation, there is no significant delay required to allow the solvent to escape. This means that the [Case] joint can be formed 'on-line' with only seconds required to complete the operation to the point at which the belt can be removed from the press." (Case at column 2, lines 36-41). Case states that the reaction between the polyesterurethane and the isocyanate is so rapid that it may be desirable to add some small amount of solvent to slow the reaction (See Case at column 2, lines 41-45). Case states that a non-reactive solvent may be added to allow the adhesive to be properly located before cure. (Case column 3, lines 7-15).

Case does not teach or suggest selecting components for a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate to improve pot life of the isocyanate urethane system and to reduce sensitivity of the system to the humidity of the ambient air. For example, Case does not teach, suggest, or provide motivation for forming a coated abrasive belt using an adhesive formed from a blocked isocyanate urethane system wherein the isocyanate of the system consists essentially of blocked isocyanate as stated in independent Claims 8 and 12, nor does Case teach, suggest, or provide motivation for using the isocyanate urethane systems stated in independent Claims 13-15. Case does not teach or suggest the advantages to be gained by reducing the sensitivity of a isocyanate urethane system to the humidity of ambient air. For example, Case does not teach or suggest the reduction in sensitivity of a isocyanate urethane system to the humidity of ambient air as demonstrated in Figure 3. Nor does Case teach or suggest the demonstrated improvement of the tensile strength of the present invention (Figure 2) over the prior art (Figure 1). Case does not teach or suggest the importance of longer pot life and reduced sensitivity to the humidity of ambient air of a isocyanate urethane system to the formation of quality belt joints, for example, belt joints having consistent tensile strengths.

Oertel is a general discussion of blocked isocyanates. Oertel does not teach or suggest the application of blocked isocyanate systems as adhesives, in general, or to the specific application of adhesives for producing coated abrasive belts. Oertel does not teach or suggest the importance of longer pot life and reduced sensitivity to the humidity of ambient air of a isocyanate urethane system to the formation of a quality joint for a coated abrasive belt.

Neither Case nor Oertel, alone or in combination, teaches or suggests the importance of longer pot life and reduced sensitivity to the humidity of ambient air of a isocyanate urethane system to the formation of quality belt joints, for example, as demonstrated by Figures 2 and 3. Neither reference, alone or in combination, teaches or suggests forming a coated abrasive belt using an adhesive formed using the presently claimed blocked isocyanate urethane systems. Case, directed to adhesive formulations wherein a reactive polyol solvent is used to increase the rate of polymer bond formation, provides no motivation to apply the blocked isocyanate concept stated in Oertel whereby thermal decomposition of a urethane group is used to free isocyanate for reaction with stronger nucleophilic compounds. As Case is directed to rapid reaction of polyesterurethane with isocyanate and that Case proposes, in only some instances, an alternative method for slowing this reaction (i.e., add a small amount of non-reactive solvent), Case does not teach or suggest the desirability of applying the blocked isocyanate concept of Oertel. Furthermore, the polyol solvent of Case is capable of reacting with the crosslinking agent at the application temperature (See Case at column 2, lines 10-15) and, as such, an application of the blocked isocyanate concept of Oertel is inconsistent with this stated property of the Case adhesive. Likewise, since Oertel does not teach or suggest the formation of abrasive belts, Oertel provides no motivation for the application of its stated blocked isocyanate concept to the formation of coated abrasive belts. Therefore, since neither Case nor Oertel provide motivation for one skilled in the art to combine the references, the combination is improper under 35 U.S.C. § 103(a).

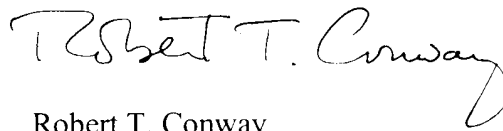
The presently claimed invention is non-obvious over Case as evidenced by Kalbow and in view of Oertel. Applicants therefore request withdrawal of the Examiner's rejection of Claims 1-2, 4-8, and 10-17 under 35 U.S.C. § 103(a).

CONCLUSION

In view of the remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner believes that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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